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AND ABSTRACT OF THE LITERATURE

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HONORARY CONSULTING EDITOR
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The Problem of Emergency Treatment in Small Factories

Review of the Recent Advances in Industrial Medicine and Surgery

The Venereal Campaign among Railway Employees

Sub-Standard Workmen

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FATIGUE AND EFFICIENCY OF SMOKERS IN A STRENUOUS MENTAL OCCUPATION *

J. P. BAUMBERGER AND E. G. MARTIN

(From the Laboratory of Physiology, Stanford University)

INTRODUCTION

THIS paper is the first of a series reporting an investigation of the industrial efficiency of persons using tobacco in different amounts. Many studies have been made of the effects of tobacco on the human body, but as far as we know no industrial output study of smokers and non-smokers has been reported hitherto. The previous investigations have dealt with such subjects as the increase in blood pressure accompanying smoking (Lee, 1); the higher percentage of smokers among pulmonary tuberculosis cases, and their lower susceptibility to treatment (Flick, 2); retardation of growth due to smoking in youth (Seaver, 3); the showing by Clark (4) and Meylan(5) that the scholarship standing of smokers is considerably inferior to that of non-smokers; and finally the finding of Lombard (6) from experiments on himself that smoking decreases muscular strength. On the other hand, as Meylan (5) points out, the lower scholarship standing of smokers may be due to their greater devotion to athletic, fraternity, and social life in general. The sociable "good fellow" type usually takes up the habit of smoking. Therefore, a classification on the basis of smoking habit may have the objection that the resulting grouping is really of the sociable as contrasted with the more studious and purposeful type of mind. Much of our present knowledge of the effects of tobacco is subject to this same line of criticism. For example: Is a person more susceptible to tuberculosis because of smoking, or is one, who by physical weakness or malnutrition is predisposed to tuberculosis, more likely to become a smoker? It is difficult to select any group for study to which criticism of this sort might not be applied, but to our minds an industrial group is likely to be as free from it as any that could be selected.

OBJECT

Our plan includes the study of the effects of tobacco both on hand workers and on brain workers. In selecting particular occupations for investigation we would naturally prefer strenuous to easy, on the theory that the harder the subjects of our study are working the more pronounced are the effects of tobacco likely to be, if any such effects exist. For the purposes of an objective study of industrial efficiency it is

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necessary that some quantitative criterion thereof be available. Current practice in industrial hygiene approves output as an acceptable criterion (Florence, 7). Obviously not many strenuous mental occupations lend themselves to output studies; the labor of professional men or of business executives cannot be described in terms of stated output. Only a task that is of a repetitive character serves our purpose. Furthermore, for the comparison that we wish to make it is necessary that a considerable number of individuals doing similar work be available for study. Most large offices have much routine work, but under modern conditions of office organization such work is ordinarily so simplified and systematized as scarcely to measure up to the desired level of strenuousness. Moreover, routine office tasks are now commonly assigned to women, who seem peculiarly fitted for the efficient handling of routine, while any study of the effects of tobacco in industry must be made on men.

We finally hit upon the occupation of telegraphy as meeting most nearly our needs, since the sending and receiving of messages by Morse code involves a high degree of attention, of neuromuscular coordination in the manipulation of the key and typewriter, of memory in the transposition of dots and dashes into letters, or the reverse, and of association in the connection of letters into words and sentences. This is the most strenuous mental operation of a routine nature that we have had occasion to observe. Through the courtesy of the wire chief and the chief clerk in a large city telegraph office we were enabled to carry on the investigation here reported. We take this occasion to acknowledge with appreciation the helpful consideration shown us by these officials.

Process

At the telegraph office we were given permission to make an hourly output study of sixteen operators, fourteen men and two women, constituting a group under a single supervisor. Two of the men were, for extraneous reasons, inadequately studied. Records were obtained only for three days, but both the wire chief and the chief clerk considered our curves strictly typical of output for the occupation of telegraphy. Moreover, we were informed that it is the regular practice of the company to base determinations of output for calculating necessary enlargements, often involving large expenditures, on the records of a single day. The operators were all highly experienced and efficient, as would be anticipated from their employment in a large city office. All but two had had ten years or more of experience as operators. One of the women had been an operator for only five years, and one of the men, a light smoker, had been at this work for only three years.

The work was carried on under high tension in a very busy and noisy room. The actual operations may be described briefly as follows:

Sending. — Remove typewritten message from file; send by Morse code with telegraph key; mark off words with pencil as sent; place completed message on file.

Receiving. — Receive Morse code message from receiver; typewrite words received; place completed message on file; place blank sheet in typewriter.

The operators studied were working an eight and one-half hour shift, from 8 in the morning to 4.30 in the afternoon, with half an hour for lunch at some interval between 11 and 2 o'clock, and an additional rest period, known as the "short relief," taken at some convenient time during the day. Thus, although the length of the shift was eight and a half hours, the actual working time was but seven and a half. Since these recess periods came at irregular intervals it was necessary to treat them in the same category as lost time from wire trouble or

slack business, correcting the records to an hour basis according to the method outlined below. A similar procedure was adopted for the last half hour of the shift, making the record as a whole correspond, therefore, to a nine-hour day.

Collection of Data

The hourly output records were collected at the end of each hour from the tally sheets which each man had on his desk. These tally sheets consist of a series of numbers from 1 to 500, one of which is checked off for each message sent or received. With the aid of the supervisor, account was taken of all time lost in wire trouble or slack business, and suitable credit was given for shorter sets of messages ("books") or for long "day messages." Other telegrams would average close to the customary ten words. It was not possible to keep the two processes, sending and receiving, separate, but as either involves its converse at the other end of the wire, the two processes can be considered as entirely comparable.

The allowance for lost time was calculated as follows: The actual number of messages handled by one operator during one hour was known, as was the number of minutes lost during that same hour by that operator; the number that would have been handled had the operator worked throughout the hour at the same rate was determined from the formula, $A_n : R :: A_t : 60$, where A_n is the actual number of messages handled, A_t the actual operating time in minutes, and R the desired number per hour.

To obviate errors due to differences in individual speed or skill the hourly outputs were recalculated on a percentage basis. The method was to compare the average output of each operator for each of the nine hours of the day with the grand arithmetic mean of all the hourly records of that same operator. Calling the latter figure 100, by a simple proportion the figures for the individual hours were reduced to percentages of the grand average. The percentage output for each hour for the whole group of operators was obtained by averaging the percentage hourly records of all the individuals for each hour.

Fatigue

From observation the operators seemed to be quite "fagged" by 2 o'clock in the

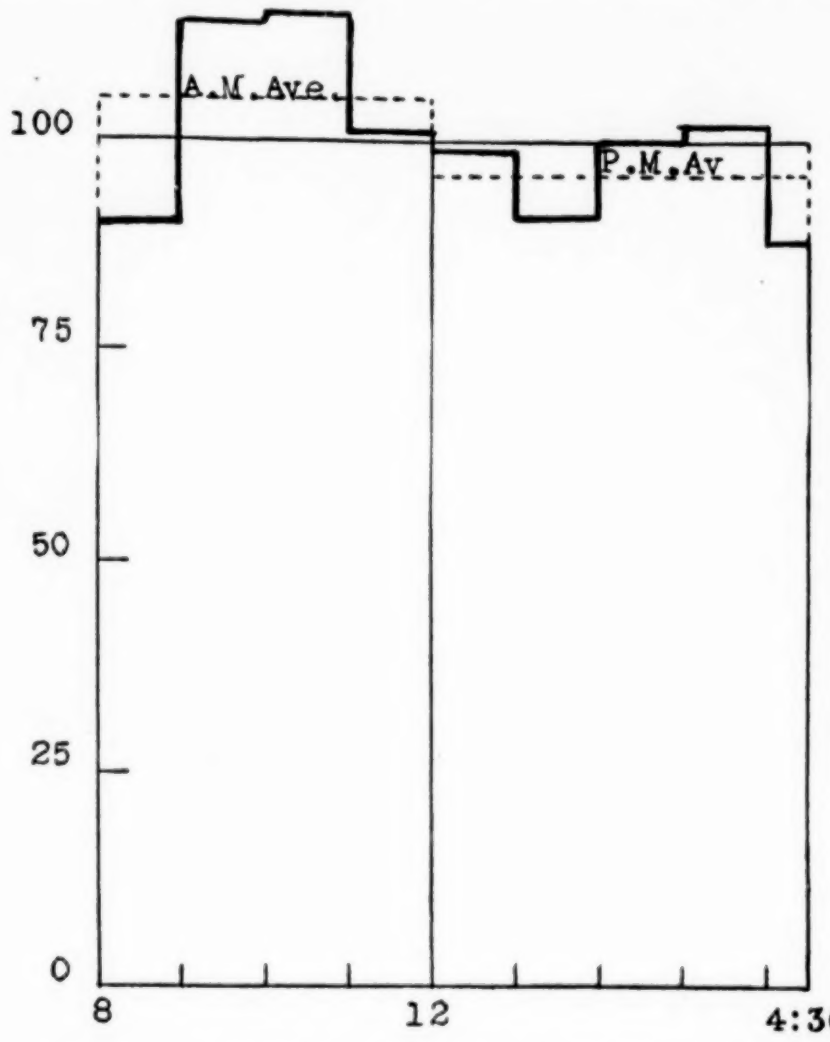

Fig. 1. — Percentage output of all operators. In all the figures the heavy upper line indicates hourly output and the straight light line, the daily average.

afternoon, and their hourly output records showed a marked decline at that time. A decrease in hourly output has usually been considered to be a definite indication of fatigue, and notwithstanding some criticism (Spaeth, 8), most current studies of industrial fatigue are employing output as a criterion. Whether the fatigue is muscular or central is, of course, not determined by this index (Bainbridge, 9).

That marked fatigue develops toward the end of the shift in Morse telegraph operation is indicated by the curves of aver-

age hourly output, shown on a percentage basis in Figure 1. This figure shows the usual speeding up early in the shift, from a percentage output of 90 in the first hour to 115 in the third; this is followed by a gradual decrease to 91 in the sixth; a recovery, amounting to 102, in the eighth; and a final decline to 88 at the end. The average for the first four hours is 105, as contrasted with an average of 96 for the last five. These characteristics are fairly typical of the usual curve of fatigue, namely, the speeding up in the first hours of the morning, followed by a decline; a similar but lower peak in the afternoon period; and a large drop at the end of the day.

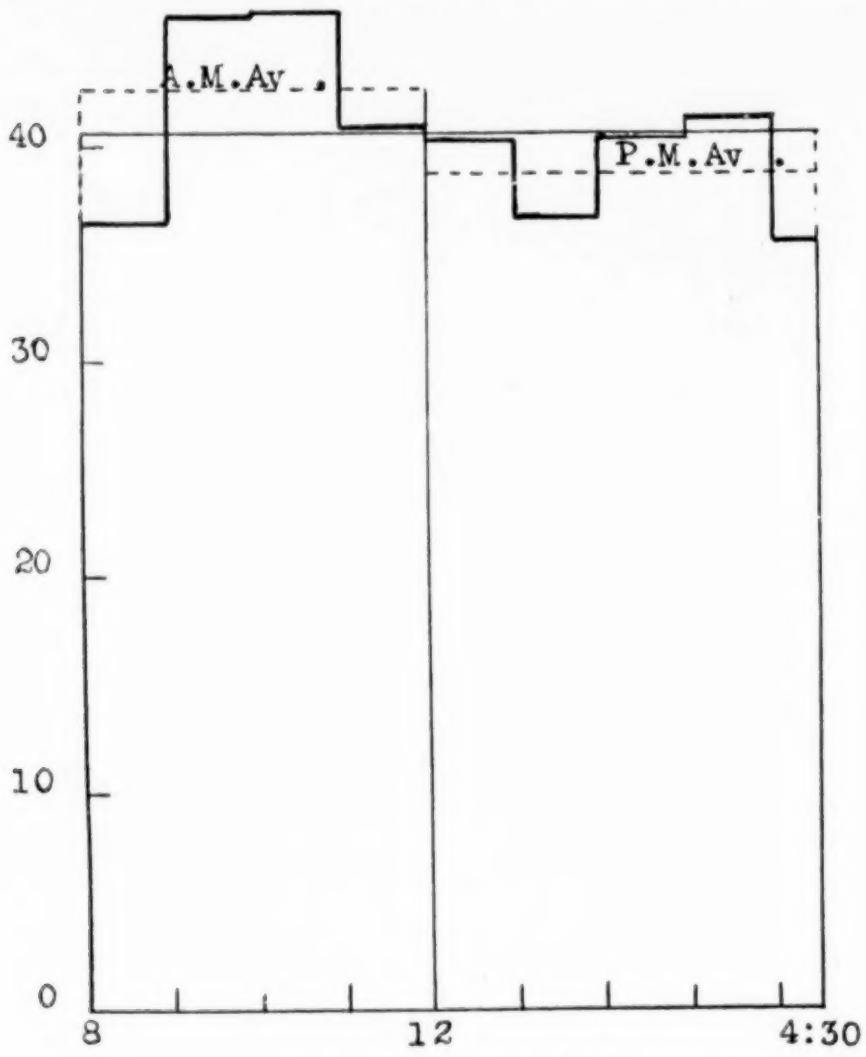

FIG. 2. — Actual output rate of all operators.

The curve of actual messages handled, corrected to an hourly basis, follows necessarily the same general course for successive hours of the day as does the percentage curve. Since the actual figures are of interest the curve showing them is given in Figure 2. As the figure shows, the rate increases from 36.5 messages an hour in the first hour to 46.25 in the third, then falls to 36.75 in the sixth, rises to 41.3 in the eighth, and falls at the end of the day to 35.5. The average message rate is 42.6 an hour during the first four hours, as contrasted with 38.8 in the last five hours of the day, the average for the whole day being 40.6.

EFFICIENCY OF SMOKERS

The habits of the individual operators, as regards use of tobacco, were obtained from the supervisor, who had known the operators for a long period of years, and who questioned them when in doubt. All the men of the group under investigation smoked more or less; the two women were non-smokers, but could obviously not be used as such for comparison with male smokers, as a basis for conclusions as to the effects of smoking on efficiency. The records of the women operators are included, however, as a matter of interest. Our study necessarily reduces itself to a comparison of light and heavy smokers so far as this particular group of workers is concerned. The men who smoked cigarettes, pipes, or cigars well-nigh incessantly while off duty were classed as heavy smokers — there were 7 men in this group; those who smoked two or three cigarettes before work, at noon, and after work, or who smoked about two pipes or one cigar a day were classified as light smokers — this group included 5 men. As stated above, the other two men did not yield sufficient data to justify their inclusion in this section of the investigation. The operators were not allowed to smoke while at work.

A comparison of the three groups, women, light smokers, and heavy smokers, with respect to output brings out some interesting facts. The comparison is of hourly rate, hour by hour, and is given in detail in Table 1. In the same table are set down the statistical bases for judging the reliability of the stated averages, namely,

the standard deviation, the probable error of the mean, and the Pearson coefficient of variability. The figures show that the average hourly output rate of the women exceeded that of the men in every hour except the fifth. Since the group of women was so small, numbering only two, this result probably indicates superior individual skill, rather than any general difference due to sex. The heavy smokers start out at a higher rate than the light smokers in the first hour (37.8 ± 0.91 as against 28.5 ± 1.62), but fall below the light smokers in all the following hours except the seventh. In the last hour the rate of the heavy smokers is 29.8 ± 1.6 as compared with 37.5±2.74 for the light smokers. The average rate for the day for the heavy smokers is 38 as against 40.1 for the light smokers and 46.6 for the women. Applying the accepted criterion of reliability, namely, the probable error of the mean, with the proviso that differences between means to be significant must contain the probable error twice and should contain it three times, the following conclusions are found to be statistically dependable (see Table 2): The heavy smokers start their work at a much higher rate than the light smokers; they fall below the light smokers during most of

TABLE 1. — COMPARISON OF HOURLY RATES OF HANDLING MORSE MESSAGES, VARIOUS GROUPS. STATISTICAL VALIDATION OF THE AVERAGES PRESENTED

Hour	1	2	3	4	5	6	7	8	9
All Operators									
Rate	*36.48*	*46.1*	*46.24*	*40.78*	*40.24*	*36.76*	*40.36*	*41.35*	*35.5*
Standard deviation	6.48	7.8	8.22	7.08	8.13	7.8	9.06	8.82	9.9
Probable error of mean	0.95	1.07	1.0	1.03	1.12	1.07	1.32	1.31	1.48
Coefficient of variability	17.7	16.9	17.8	17.4	20.2	21.2	22.4	21.4	27.8
Heavy Smokers									
Rate	*37.8*	*45.02*	*42.25*	*38.77*	*38.98*	*31.64*	*39.1*	*38.5*	*29.8*
Standard deviation	5.04	8.58	7.44	5.79	5.76	5.82	9.08	8.7	7.5
Probable error of mean	0.91	1.66	1.25	1.14	1.14	1.08	1.5	1.95	1.6
Coefficient of variability	13.3	19.0	17.6	14.9	14.8	18.4	18.1	22.6	25.2
Light Smokers									
Rate	*28.48*	*48.21*	*43.3*	*43.0*	*44.75*	*40.0*	*33.92*	*41.5*	*37.5*
Standard deviation	4.2	9.3	8.97	7.68	11.04	9.3	9.0	9.06	10.8
Probable error of mean	1 62	2.36	2.02	1.57	2.12	2.2	2.3	2.5	2.74
Coefficient of variability	14.7	19.2	20.7	17.8	24.7	21.2	26.4	21.8	28.8
Women									
Rate	*40.9*	*48.3*	*56.3*	*44.0*	*37.0*	*43.52*	*54.25*	*49.5*	*45.5*
Standard deviation	1.47	3.06	4.05	6.18	3.36	7.5	3.24	5.19	8.4
Probable error of mean	2.24	0.92	1.21	2.08	1.13	2.9	1.09	1.75	3.26
Coefficient of variability	18.3	6.3	7.2	14.0	9.08	17.2	5.9	10.5	18.5

the hours of the day; and they are working at a much slower rate than the light smokers at the end of the day.

In addition to these conclusions, based wholly on output rate, the occupation of telegraphy offers another means of judging the efficiency of groups of operators, through study of their reaction to changes

TABLE 2. — DIFFERENCES BETWEEN LIGHT AND HEAVY SMOKERS, HOUR BY HOUR, WITH RATIO OF DIFFERENCE TO PROBABLE ERROR FOR EACH HOUR

Hour	Rate for Heavy Smokers	Rate for Light Smokers	Difference	Ratio of Difference to Average Probable Error
1	37.8 ± 0.91	28.48 ± 1.62	−9.32	−7.3
2	45.02 ± 1.66	48.21 ± 2.36	+3.19	1.5
3	42.25 ± 1.25	43.30 ± 2.02	+1.05	0.6
4	38.77 ± 1.14	43.00 ± 1.57	+4.33	3.1
5	38.98 ± 1.14	44.75 ± 2.12	+5.77	3.5
6	31.64 ± 1.08	40.00 ± 2.2	+8.36	5.0
7	39.10 ± 1.5	33.92 ± 2.3	−5.18	−2.7
8	38.50 ± 1.95	41.50 ± 2.5	+3.00	1.3
9	29.80 ± 1.6	37.50 ± 2.74	+7.70	3.5

in the volume of business, known technically as the circuit load. In the organization of the city telegraph office groups of operators are assigned to various wires in accordance with the number of messages coming in or to be sent out over them. As the volume declines on a particular wire one or more of the operators working on it will be withdrawn, to be assigned to another busier wire, or perhaps to go on "short relief." On the other hand, as soon as a particular wire is found to be offering a greater volume of business than the operators on duty can care for, one or more additional men are assigned to it. The circuit load is calculated by dividing the number of messages actually handled over a particular wire by the number of operators on it, so that it is a measure of the actual average output of the group of operators on the wire in question. In calculating circuit load no account is taken of the way in which the work is distributed among the different operators; while in theory each should bear his exact proportion, in practice there are wide differences in the amount handled by various workers. The operators in our experiments were shifted about from wire to wire as need arose, so that in the course of the study they formed parts of many circuit-load groups. In every such group by comparing the average number of messages per man for the group, which, as stated above, is the circuit load, with the actual number for a particular operator one can determine whether or not the individual was bearing his fair share of the load. In Figures 3 and 4 this comparison is shown graphically for the heavy and light smokers, together with the facts as to output rate presented in Table 1. The figures show that the average circuit load increases toward evening, while the average rate declines. This means that there is very much less free time in the afternoon than in the morning While the operators are fresh they maintain a high rate, and keep far enough ahead of the business so that they gain considerable free time; in the afternoon, on the other hand, the combination of increasing business with slowing rate keeps the operators very fully occupied, depriving them of free time. It is clear that the operators who maintain the highest afternoon rate will handle more than their share of messages during that time.

The application of these considerations to our two groups of light and heavy smokers brings out some interesting facts. As Figure 3 shows, the heavy smokers handled more than their share of messages in only two hours, the second and fifth; in the first hour they handled just their share; and in the other six hours less than their share. From the sixth to the ninth hour the average circuit load affecting these operators gradually increased from 27 messages to

34; during the same period the average actual number handled by the heavy smokers fell from 25.5 to 24. The light smokers, on the other hand, bore more than their share of the load during the afternoon when the business was heaviest. The average circuit load affecting this group rose between the fifth and eighth hours from 22 to 37. In the same time the average actual

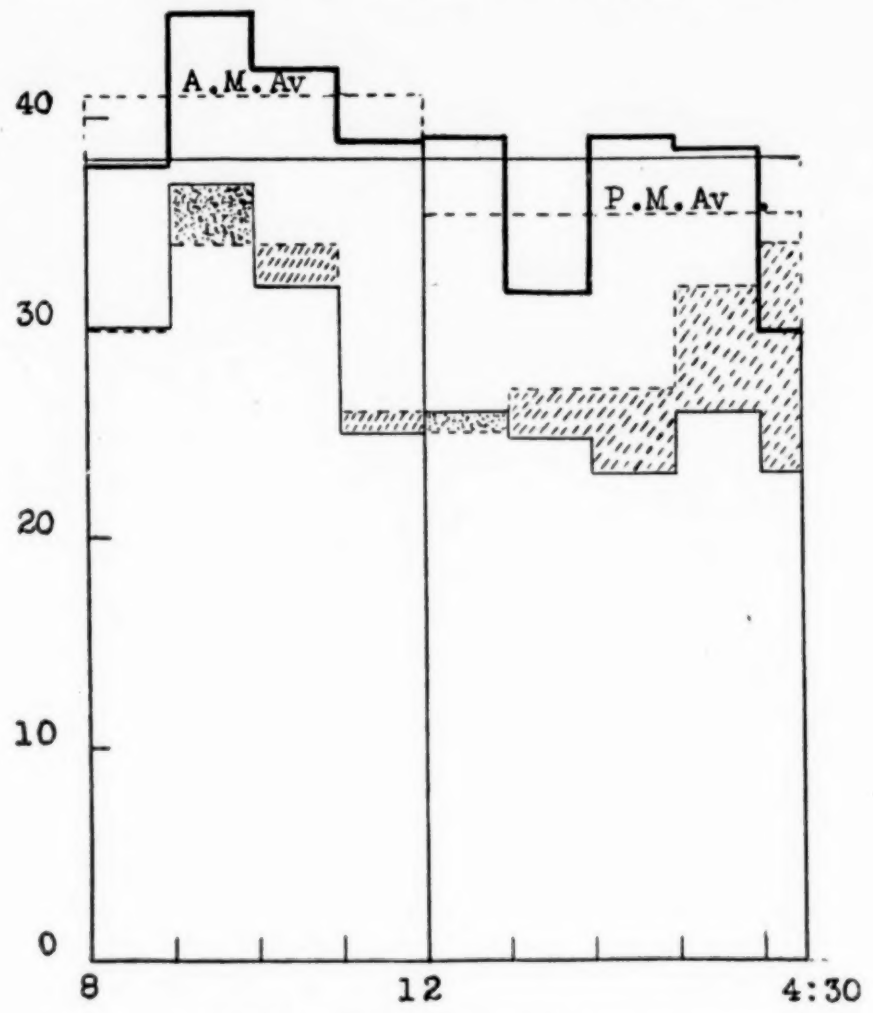

FIG. 3. — Actual output rate of heavy smokers. (See legend of Figure 1.) The irregular light line shows the number of messages handled in each hour. The irregular broken line shows hourly circuit load. Cross hatching shows number of messages handled below the circuit load. Stippling shows number of messages handled in excess of the circuit load.

number of messages handled rose from 21.5 to 39. In the ninth hour the average circuit load fell to 35, but the average number of messages handled by the light smokers fell only to 38. During the morning hours the light smokers bore almost exactly their share of the circuit load except in the first and second, when they fell far short of doing so. It happened that during the period covered by our study the light smokers were working for the first two hours of each day in groups which included two extraordinarily rapid women operators, who carried during these hours much more than their share of the circuit load, so that the men who were working with them made a correspondingly poor showing. The heavy smokers did not happen to be assigned in groups with these women at any time while our investigation was in progress.

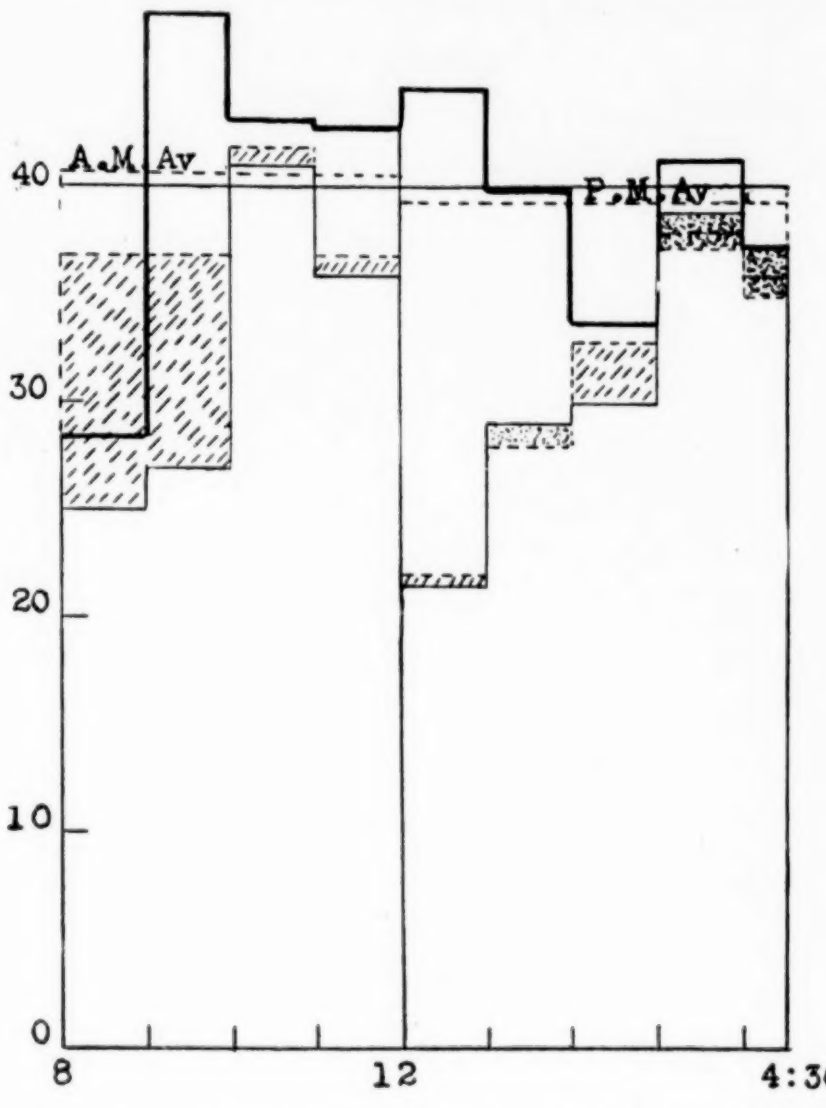

FIG. 4. — Actual output rate of light smokers. (See description of Figure 3.)

On the whole these figures establish a definitely better reaction to increase in circuit load on the part of light smokers than on the part of heavy smokers.

DISCUSSION

If the data on which we base our conclusions are representative, they establish two respects in which heavy smokers fail to maintain the level set by light smokers in a strenuous mental industrial occupation, namely, in a lessened ability to sustain output to the end of the working day, and in a diminished power to react by increased effort to an increase in the volume of business. They indicate, also, in favor of heavy

smokers, a better output during the first hours, although this does not amount nearly to enough to compensate for the lowering of efficiency toward the close of the day. On the whole, they constitute an argument in favor of moderation in the use of tobacco on the part of industrial workers whose tasks fall in the category here under discussion. Although we would hesitate to urge this conclusion on the exclusive basis of the somewhat meager data presented in this paper, it is in line with the findings of the various investigators of the records of college students referred to in the introductory section (4, 5), and also of Pack (10) in his studies of football players. All these workers agree that extensive use of tobacco goes hand in hand with relatively low scholarship. It is probable, moreover, that no class of men is oftener advised by physicians to use moderation in consumption of tobacco than that made up of business executives, men who habitually do mental work under tension. All these facts are in line with the conclusion suggested by our observations that strenuous mental work is likely to be affected adversely by heavy smoking.

Summary

1. The output curves of a small group of Morse code telegraph operators show in general the course typical of fatigue in occupations involving attention and neuromuscular co-ordination (Lee, 11).

2. The heavy smokers of the group show a higher output rate at the beginning of the day than the light smokers, but their rate falls off more markedly in the later hours, and their production for the whole day is definitely less than that of the light smokers.

3. The heavy smokers show also less ability than the light smokers to respond to increasing pressure of work in the late hours of the day by handling their full share of the work presented.

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THE PROBLEM OF EMERGENCY TREATMENT IN SMALL FACTORIES*

A. C. BURNHAM, M.D.

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THE general institution of first aid and early emergency treatment in the large munition factories and shipyards during the war period has been directly responsible for the rapid development of the first-aid movement in the industrial field. Factories which, before the war, made no provision for the care of the injured workman are now installing first-aid stations, and others, which previously made rather ineffectual efforts to provide first-aid treatment, are now, in many cases, establishing elaborate dressing stations with a physician in charge and one or more nurses constantly on duty. In one city of less than 20,000 inhabitants, for example, four industrial nurses are now on duty in place of one before the war period, while in another, a large plant which previously employed only one trained assistant now has a full-time surgeon and two industrial nurses.

Emergency Treatment in Large Factories

In a comprehensive industrial survey made by the United States Department of Labor, which covered 431 establishments employing more than a million and a half workers in thirty-one states, it was found that 375, or 87 per cent., had some form of first-aid equipment. In 110 plants there was first-aid equipment only, and in 265 plants, or 61 per cent., there were fully equipped hospitals or emergency dressing rooms with either a physician or nurse in charge. It was found that in most of the larger establishments, that is to say the plants employing 1000 or more workers, the first-aid treatment was most efficiently handled either by part or full-time industrial nurses.

Dr. C. D. Selby, U. S. Public Health Service, as a result of a detailed study of the surgical care of industrial workers in 155 establishments in the eastern and middle western states, has pointed out the fact that most employers of less than a thousand persons do not as a rule feel justified in employing a full-time surgeon and that comparatively few employ industrial nurses. He concludes that every establishment employing more than 200 persons is justified in having either a part-time or full-time physician and that the physician's services, if he is on a part-time basis, may advantageously be augmented by the employment of a trained female nurse or a person who has been taught to handle the routine work under the physician's direction.

We may conclude from the above mentioned reports:

1. That the larger establishments are making rapid progress in industrial medicine and that the employees will be, within a comparatively brief space of time, adequately cared for.

2. That workers in factories employing from 200 to 1000 persons are, as a rule, fairly well cared for and that any plan for the care of the injured should include the establishment of a dressing station with a trained attendant, together with either a part-time or full-time surgeon who acts as surgical director.

3. That the chief industrial first-aid problem today is the emergency care of the

* Received for publication June 8, 1920.

employees of small factories, that is to say in plants employing less than 200 workers.

While individually such factories represent small units, in the total, the number of employees reaches an enormous figure and the annual wage loss from physical disability, the result of accidents, amounts to many millions of dollars. A few of the small factories, either because of their isolated location or for other reasons, have made special efforts to secure emergency treatment and are now adequately cared for, but on the whole — and this is especially true in the large cities — little or no provision is made in establishments of less than 200 employees for the immediate care of the industrially injured.

First Aid Neglected in Small Factories

In New York, the Industrial Code requires that every factory employing ten or more persons shall have a first-aid kit, conveniently located and, further, that there shall be, in every such factory, an employee who has received instruction in first aid. Many other states have similar requirements but, owing to the difficulty of carrying out the practical details, first-aid treatment in small factories is often slighted or neglected entirely. In smaller communities it is the ordinary custom to send injured workers to a nearby physician for treatment. This often entails a trip of a mile or more, and frequently a wait of several hours or even longer, before the physician can be seen. In cities, injured workers are usually sent to the emergency room of the nearest hospital. In some cases this represents a trip of several miles and a delay of an hour or more.

The disadvantages of both of the above methods of first aid are at once apparent. The delay not only causes loss of blood and an increased tendency to infection but, in severe injuries, greatly increases the severity of the degree of traumatic shock. In addition, the difficulty of securing treatment causes neglect of minor injuries with occasional severe infections and prolonged disability as a consequence thereof. In New York City it is not uncommon for a patient to present himself at the hospital emergency room with a badly infected wound, three or four days old, which has had absolutely no treatment since its occurrence.

The industrial first-aid problem, then, which presents itself to the community, is the care of the injured of smaller factories. Employers of large numbers of workers may, as a rule, be expected to see the benefit of first-aid treatment and to make necessary arrangements for its installation, but the care of the injured of the small factories presents a community problem which is only being partially met under existing conditions and which must be solved by co-operative action of employers, industrial workers and the community at large.

Plans for Emergency Treatment

There have been several plans advocated for the solution of this problem. They may be classified under three general headings as follows: (1) the Red Cross method of promoting instruction in first aid among industrial employees; (2) the medical commercial method of securing emergency treatment; (3) the establishment of municipal or community first-aid stations.

1. *Instruction in First Aid.* — The method adopted by the American Red Cross is intended so to train a given number of carefully picked employees in various factories that they may be fully prepared to administer intelligent and efficient first-aid treatment immediately after the accident occurs. In addition, training in first aid is to be extended as far as practicable to the household and the school so that not only especially chosen employees may be qualified in first aid,

but that also many of the wives and mothers and practically every high school graduate may have a reasonably clear understanding of the control of hemorrhage and the dangers of wound infection. The equipment recommended by the Red Cross is a standard industrial first-aid box for factories, a somewhat modified box for schools, and another for household use.

The plan as advocated consists of classes organized by the local chapter and taught by local physicians. In the case of industrial establishments, such classes are ordinarily taught by the plant surgeon who is paid by the employer. Where this is impossible the local Red Cross chapter sometimes organizes the classes to include the employees of several different firms, in which case a small fee may be charged or the chapter may bear the entire expense. Plans similar to those now being carried out by the American Red Cross are also being developed by other national and local organizations.

2. *The Medical Commercial Plan.* — This plan contemplates the establishment throughout the community of numerous dressing stations under the control of one or more of the local surgeons. Either a nurse or a trained attendant is placed in charge and a physician is employed on part-time or full-time duty, depending on the amount of work to be done. If no physician is present when a patient applies for treatment, first-aid treatment is given and the patient sent either to a nearby hospital or, if the condition permits, allowed to wait for the surgeon who is summoned at once. Such a plan may originate with a group of employers who, seeing the need for treatment, combine in paying the expenses; it may originate with a physician or group of physicians who, on their own initiative, establish a series of dressing stations in order to regulate their work and to control properly their cases from a purely business standpoint; or, in a few cases, insurance companies may set up a similar plan, establishing local dressing stations in connection with small community hospitals for the treatment of employees working in various establishments but all insured by the same company. It is reported that the savings in losses due to disability fully repay the insurance company for the expense incurred.

The advantages of this plan are clearly evident; it secures early and adequate treatment for the injured worker and allows the physician to work under the best conditions. The disadvantages are that it is largely commercial and that differences of opinion in regard to expenses and fees are almost certain to occur, and further that it is frequently difficult to convince the small employer of the necessity for this service.

3. *The Community First-Aid Station.* — By a community first-aid station is meant a conveniently located place where patients may receive emergency treatment and temporary care before being sent to their homes or to the hospital. It should theoretically consist of a small room with two or more cots and supplies for ordinary dressings. Sufficient equipment to supply light nourishment, such as hot coffee or broth, is desirable. The equipment, of course, varies considerably according to the local requirements.

First-aid stations may be located in villages or small towns where there is no hospital or, in cities, in localities where hospitals are not easily accessible. In some cases they may be established by the local community, in others by some of the local industries, and in others they may be simply branches of the local hospital. In a few cases railroads have established such stations for the benefit of their own employees and have made the services of the stations available for others in the community when accidents occur. Stations should be centrally situated and may advantageously be placed in a school building, in

the local library, in police or fire stations, or at other locations where they are convenient to the center of the population covered.

There should of course always be a physician on call and preferably a trained nurse in attendance, but in certain cases, especially in smaller communities where the demand is less acute, the nurse may be replaced by a trained first-aid worker, who is in attendance at the station in addition to other local employment.

Physicians, especially those interested in preventive medicine, may accomplish considerable for the betterment of the health of the community if they will make their influence felt for the improvement of emergency treatment, especially for those injured in industrial employments. If each physician makes a study of his own particular locality and attempts to stimulate community effort for the immediate care of the injured, the result will be not only a diminished wage loss due to accident but the actual saving of human life.

REVIEW OF THE RECENT ADVANCES IN INDUSTRIAL MEDICINE AND SURGERY*

Proposed Scheme of Application of these Principles in a City of Small Industries

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INDUSTRIAL medicine and surgery as branches of the science of medicine are of but recent origin. Yet their recognition as entities has been firmly established during the past few years, and the scope of their activities is so far-reaching that they are intimately allied with the best interests of public health, labor, progressive business and increased production. Industrial medicine and surgery may be defined as the theory and practice of medicine as applied to the prevention of illness and accident among industrial workers, the prompt restoration of workers to productive activity when illness or accidental impairment have occurred, and the constant maintenance of the highest efficiency of the human element in industry.

Among the recent stones laid in the building of their broad recognition is the establishment in the University of Cincinnati of a Department of Industrial Hygiene. This department was equipped and is maintained by subscription of the various manufacturing concerns of the city of Cincinnati. Like departments are integral features of Harvard and Rush Medical Colleges, and efforts are being made for the establishment of courses on this subject in other medical colleges and institutions of learning as the growing need for trained industrial physicians becomes ever more urgent.

Further, journalism peculiar to this field has been developed. The industrial departments of the magazines, *Modern Medicine* and *Hospital Management*, are a dominant feature of these publications. *The Journal of Industrial Hygiene* devotes its entire space to medical industrial problems. One of the greatest contributions to medical literature for the year is *Industrial Medicine and Surgery* by Dr. Harry Mock of Chicago.

It is the consensus of opinion among many foremost physicians that the advancement of industrial medicine by both the medical profession and industrial managements will be an outstanding feature of the coming year. Dr. Herbert T. Davis, chief surgeon of the Aluminum Casting Company and other Cleveland industries, says:

> The best of the medical profession have in the past looked askance at industrial work, because of lack of system and business methods in the average doctor's work. Most doctors are individualists in thought and action, and there is a generally prevailing idea that industrial medicine is performed by "down-and-out" doctors, at contract rates enforced by heartless corporations.
>
> The profession is changing its attitude as its members see what can be accomplished by organization and group practice as exemplified and demonstrated by various organizations now existent.
>
> On the side of business, there is the awakening sense that cheap and inferior medical work is not satisfactory in any particular and is often disastrous, and that the best medical talent should be procured. This presages the getting together of the best in medicine and the best in industry, to their mutual benefit.

Dr. Charles A. Lauffer, Medical Director of the Westinghouse Electric and Manufacturing Company at East Pittsburgh, Pennsylvania, is of the opinion that the industries of any community reflect upon the public health conditions of that com-

* Received for publication May 6, 1920.

munity, hence industries cannot be satisfied unless conditions in the area from which their employees come are satisfactory; and, *vice versa*, the community should not be satisfied if its industries do not minister to the maintenance and elevation of the standards of public health.

A greater recognition of this branch of medicine by the promoters of industry is evinced in the rapid growth of elaborately equipped medical departments, not only in the larger industries but in the smaller institutions as well. To what can such a demand and popularity for this new branch of medicine be attributed? It is indeed true that public opinion, unscrupulous litigation and labor agitation have been responsible, to a certain extent, for the almost universal enactment of accident compensation laws throughout the country. The introduction, however, of medical as well as surgical service, the appreciation of the value of the most efficient lighting, heating and ventilating systems, the earnest effort to prevent occupational diseases among workers — these are not mere philanthropic or charitable donations, but are purely an application of good business principles. The saying, "a man is better than a machine," daily becomes more applicable. The human element of industry is indeed of greater importance than any other factor of production. A healthy man is more efficient than a sick man, therefore more productive. It is a matter of business policy to protect the great human factor of industry and in every manner to promote conservation of life and health as one of the most valuable assets of national wealth.

Among the various answers received from responsible officials to the question, "Why do you maintain a medical department?" as quoted from a recent article by C. D. Selby, M.D. (Consultant in Industrial Medicine and Surgery), are these:

"Purely for service" was the characteristic reply of one of the officials of the Ford Motor Company. "We owe it to our men," said the superintendent of the Toledo Furnace Company. "It is a check on conditions that impair health," testified the manager of the Willard Storage Battery Company. Another sincere reply: "To safeguard the health of workers in the belief that the healthy worker is more efficient." Others wrote: "Constant medical service is insurance against damages," "Health education reduces absenteeism 50 per cent.," "Keeps men on the job," "Reduces labor turnover."

Among the foremost factors, then, which induce managements to offer to their employees medical and surgical service are the following:

1. The acknowledgment of their obligation toward the workers who sustain injuries during the performance of their duties, and the stress brought to bear by legislation, regulating compensation for such injuries.

2. The fact that this service tends to prevent litigation by active interest in the welfare of the disabled, and also reduces the compensation insurance expense.

3. It aids in removing the influences of unrest, promotes goodwill, and reduces the labor turnover.

4. It is capable of preventing loss of time.

5. It enables the worker to produce more.

6. Lastly, it is absolutely essential to isolated industries.

Scope of the Work

The industrial medical department, as successfully worked out in large institutions, includes:

1. The maintenance of first-aid station, hospital and clinical facilities.

2. A staff consisting of two groups:

(a) At the plant

i. Doctors to care for minor ailments and injuries.

ii. Nurses as assistants and for home nursing and care.

(b) Diagnostic clinical group, with every facility for accurate work, consisting of specialists — medical, surgical, dermatological, orthopedic, roentgenological and dental.

3. The treatment of emergency accidents.

4. The treatment of sickness and dental infirmities.

5. The sanitary supervision of the plant.

6. The instruction of employees in prevention of accidents, occupational diseases, home and personal hygiene.

7. (a) The examination of new employees and recommendations as to their physical fitness to perform the expected tasks.

(b) The examination and rating of old employees as a check on their physical fitness.

Practically all the literature on this subject is the result of broad experience with its application in large industries of thickly populated portions of the country or in extremely isolated areas. There are, in fact, comparatively few institutions employing less than 500 persons that maintain full-time medical service. There is reason to believe, therefore, that the managements of small industries have not yet attained the philanthropic attitude of mind necessary, or do not deem the time ripe for the expenditure essential to maintain such service, but prefer detached medical services limited to the care of injuries, with but little or no thought of the physical welfare of their workers.

In order to become more thoroughly acquainted with local conditions in a city of about 70,000 inhabitants, having only comparatively small industries, a questionnaire was addressed to practically all the manufacturing concerns of the city, as well as the larger retail and wholesale business houses, as follows:

1. How many are employed by your company? Of these, how many are clerically employed?

2. Are you protected by workmen's compensation insurance in case of accident to any of your employees?

3. Have you any method of compensation in case of sickness. If so, please outline scheme.

4. Have you a medical department? A dispensary? A first-aid station?

5. Have you ever considered the introduction of an industrial medical department in your institution? Have you any suggestions as to how such a department could be established in manufacturing concerns of less than 1000 employees?

As the information acquired by these replies is regarded as confidential, the names of the firms are withheld. The answers received embrace a limited survey of thirty-four institutions employing 4291 workers, of which number twenty-four have less than 200 employees, and ten between 200 and 550, the two largest employers being in the retail business and the only firms in this class consulted.

The Workmen's Compensation Act of this state protects not only the employee but also the employer, to a certain extent, from the wrongs of unprincipled litigation. It furnishes surgical and hospital care to workers injured in the performance of their duties, also compensation consisting of half-pay after the first week of disability. Should the disability last longer than six weeks, compensation is allowed for the first week. In case of permanent disability, partial or complete, compensation is allowed at a fixed rate, depending upon the amount of impairment of function. The liability for this compensation is assumed by various insurance companies at a very moderate cost, and practically all employees avail themselves of this protection. In fact, every firm from which replies were received is so protected.

There is an institution in this city employing about 250 men and having a benefit association to which each employee may belong by paying 1 per cent. of his wages. If disabled by sickness, the employee receives, after the first week, one-half of his

wages; also, the doctor's and hospital bills are paid by the association. Regular pay during illness is given by a concern employing comparatively few men. Another grants compensation in case of sickness, but does not state how much.

Not a single firm has an organized medical department, yet four institutions have considered such a step. The consensus of opinion, however, seems to be that their institutions are too small to warrant such a venture. The idea, however, of a co-operative medical unit serving several institutions was voiced by one very progressive manager. The statement that physical examination of prospective employees and periodic examination during service would prove valuable in determining the fitness of men for various positions, was also advanced in the belief that this too would aid in promoting efficiency.

Seven institutions have first-aid stations equipped for the care of minor injuries, prior to sending the injured to a doctor's office. This limited service is carried on by trusted persons who happen to know something of the principles of first aid. Several firms have first-aid cabinets, and one firm with a rather peculiar hazard has men trained in resuscitation and the use of the lung-motor.

The almost universal interest demonstrated by officials in making their replies to this questionnaire has convinced me that the advisability of medical as well as surgical service, and some manner of compensation for sickness, is realized; but a plan for the establishment of such service is a problem for which they offer no solution.

The medical departments of large institutions have approximately one physician to each 200 to 500 employees, as many nurses, and half as many attendants. It would not, therefore, be unreasonable to expect organizations employing 200 to 500 persons to maintain a medical department offering at least part-time service. Such a department would, however, be out of the question for establishments employing less than 200. Apparently for a community such as ours, made up mostly of small industries, any effort to offer adequate industrial medical service should be of a co-operative nature. Various attempts in this direction are being made by manufacturing associations and by retailers' and wholesalers' associations, an example of which is the Central Manufacturing District of Chicago. This is an organization comprising a number of the smaller industries located in a certain vicinity of Chicago, the basic purpose of which is to render shipping and switching service. Other functions have been centralized in this organization, among these being medical service, a dispensary situated in the district, and an ambulance, thereby offering immediate medical attendance available at all hours. The Manufacturers' Association of Erie, Pennsylvania, maintains a compensation and casualty insurance for its members. Co-operative traffic bureaus, furnishing ratings, freight routing, tracing of lost shipments, etc., have been successfully worked out by manufacturers. The function of these bureaus has in some instances broadened to embrace employment agencies and to furnish physical examination and physical rating of applicants, liability insurance, and even medical service.

This paper is merely an attempt to bring to your attention the advances, recognition, and good business policy of industrial medicine and surgery, with the hope that more light may be shed on a plan of application to the industrial medical problems of a small city. The following scheme outlines a plan for a co-operative industrial bureau with a medical department adaptable to the needs of a city of small industries.

A Proposed Plan for a Co-operative Industrial Bureau with a Medical Department Adaptable to the Needs of a City of Small Industries

Administration

Chief Executive, or Director of the Bureau
- Employment Department: director in charge, and co-workers
- Insurance Department — health and accident: director in charge, and co-workers
- Medical Department: director in charge

Group I

Consists of a completely equipped diagnostic machine, including laboratories needed and hospital affiliation.

Personnel
- (a) Professional:
  - Internist
  - Orthopedist
  - General surgeon
  - Roentgenologist
  - Dentist
  - Hygienist
  - Nurses
  - Attendants

Duties:
- Examination of prospective employees
- Diagnosis and treatment of sickness and dental infirmities
- Care of accidental injuries
- Sanitary supervision of plant
- Instruction of employees

- (b) Administrative:
  - Bookkeepers
  - Stenographers
  - Clerks

Group II

Presupposes the division of the industrial work of the city into districts, each in charge of a district surgeon, whose duty it is, with the aid of a nurse, to attend the injured and sick in the various industries, referring severe injuries and doubtful ailments to Group I for diagnosis, treatment or hospitalization.

Such a plan involves an initial outlay of a large amount of capital. However, if the organizations co-operating in such a scheme should represent something over 5000 workers, the relative expense and upkeep would be fairly moderate, while the satisfaction derived from such a project should be overwhelming.

THE VENEREAL CAMPAIGN AMONG RAILWAY EMPLOYEES *

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THE problem of reducing the incidence of venereal disease among railway employees may best be considered from three points of view: (1) educational, (2) prophylactic, and (3) curative.

I. Educational Program

The educational program outlined so well by the United States Public Health Service should properly be considered under prophylactic measures, were it not for the intrinsic importance at the present attached to this work. To be effective, the purpose of this education must be to create a public demand that venereal diseases shall be managed as communicable and therefore quarantinable affections. The whole program will fall flat unless this goal is achieved. Such an end result is unhappily delayed several years by one of the weak points of our form of government which, like the exception to the rule, proves the wisdom of it. We have laws, federal and state, by which in a few weeks an autocratic administration could obtain the result sought, yet we must painfully and expensively educate these laws into effectiveness. The by-products of this education are only a little less valuable. The quack and the advertiser are seeking shelter elsewhere. The legitimate medical profession and the hospitals are learning that they have a duty to the patient with venereal disease — a duty not alone to treat but to treat adequately. The mystery of sex relationships and their disorders dissolve slowly in fuller knowledge. Above all the sham of shame is displaced by the discovery of a contagious disease.

To the physician who has thought loosely about venereal problems, to the employers and leaders of labor, there is coming a realization of the largely decreased labor output, the actual loss of time, the frightful aggregate of suffering, the cause of many accidents, and the contagiously disgruntled and reckless disposition which accompany the most widely distributed diseases known in man.

A glance at these objects of the educational program will convince anyone that the dangerous occupation of railroading, involving the utmost care for the safety of the traveling public, is most directly concerned. The conferences lately held by the Committee on Health and Medical Relief of the United States Railroad Administration and the United States Public Health Service with railroad representatives have shown a few ways in which the railways may assist the government, and themselves, to rid this country of its greatest plague. Meetings between the employees and representatives of the medical department, circulars and posters, venereal disease clinics in shop towns, motion picture shows on the subject, and close co-operation with state and federal agencies, comprise the educational program worked out at these meetings.

The St. Louis Southwestern Railway, from the venereal point of view, occupies the unique position of the only railroad in this or any other country, so far as I know, which gives a full service. Before the present campaign, an educational program, a very limited prophylactic service and a complete curative service were maintained by this road. The results are shown in the accompanying tables of

* Read before the Southeast-Missouri Medical Association May 5, 1920. Received for publication June 4, 1920.

statistics. (Tables 1 and 2.) You will notice that the end results are not all that could be wished. For this there are, of course, reasons. Physicians do not like to treat venereal diseases. This attitude leads the patient to think even more lightly of his ailment than is his too frequent custom.

TABLE 1.—STATISTICS OF CASES FROM FREE VENEREAL SERVICE AT TEXARKANA HOSPITAL, MEDICAL DEPARTMENT, ST. LOUIS SOUTHWESTERN RAILWAY LINES

Disease	1918 New Cases	1919 New Cases	Per Cent. Increase	1919 Per Cent. Cured	1919 Per Cent. Probably Cured	1919 Per Cent. AWOL
Syphilis	56	86	53	0	0	79
Gonorrhea	83	125	50	0	25	69
Chancroid	18	29	61	48	10	38
Other venereal disease	..	1	..	100		
Total or average	157	241	53	6	14	69

TABLE 2.—COST OF VENEREAL SERVICE AT TEXARKANA HOSPITAL, ST. LOUIS SOUTHWESTERN RAILWAY LINES

Disease	Cost 11 Months, 1919	Cost per Case	Cost to Complete Case
Syphilis	$5,235.49	$66	$200
Gonorrhea	5,695.95	50	125
Chancroid	953.81	35	50
Other venereal disease	29.90	30	...
Total or average	$11,915.15	$54	$143

Laws intended to insure adequate treatment have not been enforced, and it is impossible to keep track of the majority of venereal patients until a cure is reached. Among railroad employees this is particularly true because of the distances covered almost daily, the change of runs and tricks, the almost constant reinfection, and the labor turnover.

To educate what may be called venereal responsibility into railroad employees, placards—like the one below—have been placed in toilets, circulars have been sent to each employee, and follow-up letters to the men known to be infected. Above all, personal talks with the men probably give the best results.

BULLETIN NO. 2

FREE VENEREAL SERVICE

OF THE

MEDICAL DEPARTMENT

OF THE

ST. LOUIS SOUTHWESTERN RAILWAY LINES

Employees suffering with gonorrhea, soft chancres and syphilis should apply to their foremen for Red Cross Certificate, obtain pass from agent, and come immediately to the St. Louis Southwestern Hospital at Texarkana. You should arrange to spend several weeks if necessary at the hospital, because these diseases may be serious to yourself if neglected, and usually the treatment is more effective while you are resting. Moreover, these diseases are contagious or infectious, and you owe it to your fellow employees to come to the hospital and get a complete cure.

The employee who is unfortunate enough to become infected with a sexual disease, and takes his treatment like a man, is not looked down upon.

II. PROPHYLACTIC MEASURES

The reason that syphilis is eight times as prevalent among railroad employees as among farmers * is probably largely due to the housing problem. At the end of runs away from home, the boarding house is too frequently the home of prostitutes. The railroad Y. M. C. A. houses are of course intended to supersede this evil, and to some extent do, yet the total effect is small in comparison with the whole problem.

Treating infected women under strict quarantine has been carried out by the U. S. P. H. S. with some success. The real effect of this prophylactic measure will never be realized until men are placed upon the same footing as women and receive the

* J. H. Stokes and H. E. Brehmer: Syphilis in Railroad Employees, JOUR. INDUST. HYG., 1920, 1, 419.

same treatment. The man who takes his treatment faithfully under a competent physician does not need strict quarantine. The man who fails to consider the rights of others must be placed under restraint. The same statement applies equally to women.

The greatest single prophylactic measure known has been discarded by the U. S. P. H. S. The prophylactic treatment, or early treatment, is not encouraged for two reasons: the supposed opposition of the church and of moralists arguing that one cannot preach continence and at the same time offer a safeguard for incontinence; and, secondly, the claim that prophylactic treatment is only 50 per cent. efficient. These objections are so important to this campaign that one cannot pass them by without answer. The first objection is practically annulled by the experience of Pennsylvania where the early treatment is advocated and packages for self-medication, endorsed by the state Department of Health, are sold in the drug stores. In that state there has hardly been a voice raised against the method, and I have not heard anyone accuse the 9,000,000 people of Pennsylvania of less religion or morality than may be found in other states. Moreover, to preach continence may be, and is, a good measure, but what about the boy or girl who has not listened? Must he be condemned to syphilis or gonorrhea? Morality has sunk to a very low level when it prohibits the best possible relief from the consequences of not following the advice of morality.

Is early treatment only 50 per cent. efficient? The many years' experience of the Navy is not in accordance with such a statement, and the only reason I can see that the Army in the recent war may have had such an experience in France is poor quality or tardy treatment or poor records. In the case of treatment within six hours in private practice, I believe 90 per cent. efficiency would be more correct. But for the sake of argument, let us suppose that it is only 50 per cent. efficient. Does anyone know any other measure which can now be practically applied which gives 10 per cent. efficiency? The two arguments against this effective early treatment are the result of sentimentality rather than morality on the one hand, and of an utter lack of perspective on the other.

The final difficulty seems to lie in the reporting of venereal diseases, and here the state of Pennsylvania has departed from the program of the U. S. P. H. S. Dr. Martin, Health Officer of Pennsylvania, believes that physicians are not yet ready to report venereal diseases. Let me ask — If the most widely disseminated communicable diseases known in man should not be reported, then why report any infectious disease? All the arguments for reporting communicable diseases other than venereal apply with added force to syphilis and gonorrhea. If members of the medical profession are not ready for reporting venereal diseases, are they ready for the practice of medicine at all? Do they deserve a license from the state? Are they just to the patient and to the community? The medical profession is, I believe, ready for it, but the half-hearted manner in which the venereal laws have been enforced has led many to believe that these laws are a dead letter. The manner in which at least some of our pharmacists have been approached by the agents of the U. S. P. H. S. has left the impression that these laws never were meant for enforcement. Do not blame the profession for a weak executive force.

To summarize: This campaign needs every prophylactic measure known to be of real efficacy, broad moral education, the reporting of all cases, complete treatment, and segregation with forced treatment for the unruly and for chronic carriers, male and female.

III. Treatment

It is hardly necessary to enter into the treatment of gonorrhea here, except to express the wish that it were much more efficient. With syphilis one has much greater difficulty in completing treatment because of the minimum of two years of active medication. This fact is very difficult for the average man to realize after all visible and subjective symptoms have disappeared. Here again the thorough enforcement of existing laws would greatly assist. The minimum standard which we have adopted in the St. Louis Southwestern Railway lines is very similar to that advocated by the U. S. P. H. S. except that we have found the elder Keyes' method of giving mercury by mouth more practical in railroad men. We try, however, to give as much as possible by deep intra-muscular injection. The important point in treatment, of course, is completeness. Our venereal technician and our physicians are instructed never to discharge a case of gonorrhea until at least two smears taken after thorough prostatic massage are found negative, and in no case of syphilis should the case be lost until the course of treatment is complete and at least several negative Wassermanns are obtained.

In conclusion, let me make a plea for a more energetic enforcement of the laws written on the statute books of some forty-seven states for the protection of the public against venereal diseases. You may not know that many railroad men in the beginning were afraid that the labor leaders would make trouble about a venereal campaign among railroad men. On the contrary, these leaders have enthusiastically supported us, and I have faith that they will support every measure honestly carried out for the protection of labor. Up to date this campaign has been most cautiously approached. It seems to me that the time is about ripe for less of this caution, for less of a jelly-fish spine among officials. If we have a measure which is even only 50 per cent. efficient, as some would have us believe, for the good of humanity in ridding this country of the greatest plague ever known, let us use it. If physicians will not report venereal diseases, the time is at hand to prosecute them. If patients have not sufficient responsibility to abstain from stealing their neighbors' health, we should apply the same executive treatment as we do apply to those who steal their neighbors' wealth. To go on as we are now, condoning the infraction of laws which are in effect, passing by the greatest weapon because of supposed opposition, and in one state at least openly avoiding the reporting of these communicable diseases, we are inviting disaster. This campaign, as I see it, is making headway far too slowly. It needs the injection of punch. The U. S. P. H. S. mapped out these very laws, and it has been of the greatest assistance to us. We owe it a debt of gratitude. The way to help is to insist, to demand, that these laws be enforced. They were not written to make sport of.

Gentlemen, let me leave this plea with you. If you have any conception of what venereal disease means to the welfare of this country, of the amount of lawlessness which it causes, of the great loss to industry, of the suffering of wives and of children, of the financial ruin of families, of the cost to the state for the care of tabetics and the insane, forget the sham of prejudice and look upon this plague as you would upon any other contagious disease — report it, quarantine it if necessary, use every measure of prevention, and treat it adequately. Then only will you do your duty to the state which licensed you to practice the art and science of medicine — the state which has a right in return to expect that you guard faithfully the well-being of the commonwealth.

SUB-STANDARD WORKMEN *

W. IRVING CLARK, JR., M.D.
Medical Director, Norton Company, Worcester

SUB-STANDARD workmen may be divided broadly into three classes: those who are sub-standard mentally but standard physically; those who are sub-standard physically but standard mentally; those who are sub-standard both mentally and physically. The problem is how we can make use of these men in industry and at the same time make them better workers and stabilize the large existing turnover which they create by wandering from one place to another.

The acute shortage of labor which occurred during the war and which exists today has made manufacturers appreciate a problem which up to that time had never come to their notice with sufficient force. The production of the country requires the use of every individual and requires his use to the very best of his capacity. Unless a sub-standard worker is properly placed, he is either an inefficient worker and, therefore, discharged by his foreman, or he becomes dissatisfied because of his physical inability to do the work and leaves the organization to try elsewhere.

This constant shifting is one of the great overhead expenses of industry. Alexander has shown that the average cost to the employer of every change of position is at least $35. No statistics have been obtained as to the cost to the employee, but the combination of time lost from actual work, expenses which continue during his period of non-work, his traveling expenses as he moves from place to place, and his decreased earnings as he familiarizes himself with a new shop, must amount in each individual case to more than the sum which it costs the employer. The solution is the proper placing of the sub-standard worker in industry and the ability to hold him in this position with a minimum amount of change.

If we consider our first classification from this point of view, it is evident that the man who is mentally sub-standard but physically standard can usually be placed without difficulty at heavy work requiring no particular mental ability. There are very many places of this type open in every industry, and if the work and wages are attractive there should be no difficulty in holding the man for a considerable period of time.

Where the mental condition is standard but the physical condition is sub-standard, the problem falls upon the industrial physician and it is with this class that he is able to do his most effective work.

When both mental and physical condition are sub-standard, the applicant is usually unfitted to work in any department of the factory, and it is advisable for his own good and that of industry that he turn his work into other fields.

Every factory of any size whatever is divided into departments. The type of work in these departments varies. If the type of work is analyzed it is found that there are two broad types, light work and heavy work; and if these are further subdivided they will be found to consist of light work with and without special hazards, such hazards being dust, heat, humidity and other physical conditions which militate against the health of the worker. Heavy work may likewise be divided into heavy work in which there is a good general working condition, and heavy work in which the working conditions are poor. It is evident, therefore, in placing a mentally standard and physically sub-standard man,

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that the particular type of work for which he is physically fitted should be found if possible. If such an effort is seriously made by the industrial physician in consultation with the employment manager, a large amount of unnecessary discomfort to the workman, sometimes resulting in ill health and even danger, may be avoided; while from the point of view of the employer, a more contented worker and one who will remain more steadily on his job will be produced. In other words, proper placing should reduce turnover.

How is this proper placing to be accomplished? It is evident that no one by a casual glance can tell whether a workman is sub-standard physically or not. A careful and yet rapid physical examination is the only method by which the industrial physician can determine the risk of the applicant. In most factories where physical examinations are used, applicants for examination are classified into four great groups which are designated by the numbers, 1, 2, 3 and 4, or the letters, A, B, C and D. The first group consists of those men who are mentally and physically standard. The second group consists of men who are mentally and physically sub-standard but not enough so to militate against their employment in any department in the factory. The third group consists of those men of whom we have just been speaking, namely, those who are mentally standard but physically sub-standard to such a degree that placing in some particular department is necessary. The fourth group consists of those who are so far sub-standard mentally or physically, or both, that they cannot be employed anywhere in the factory with safety to themselves, to others, or to property.*

The doctor, after his examination, having determined into which one of these four groups the worker falls, has two methods of procedure: First, he may write a prescription of the type of work which the applicant is physically able to do, or, second, he may confer with the employment manager as to the exact job upon which the applicant should be placed. In a large factory it is possible to place all but 0.5 per cent. of the applicants, and these will fall in the fourth of our original classifications, or Class D — namely, men who are unable to work in any department because they are mentally and physically sub-standard, or are so sub-standard physically that there is no department in which it is safe for them to work. Ability to place men properly depends upon the industrial physician's knowledge of the work in the various departments, and this knowledge can only be obtained by familiarity with the work and by experience.

Sub-standard men usually fall into one of the following classifications: cardiac, nephritic, pulmonary, hernial, syphilitic, special, and general.

Cardiac cases which are unable to work are relatively few. Our experience confirms that of MacKenzie that hearts, even though they show, on examination, marked murmurs and even irregularities, are usually able to stand moderate work for a number of years before showing signs of disturbed compensation. The industrial physician should not only be interested in what he hears with a stethoscope, but should endeavor to ascertain the condition of the myocardium. Though this is an extremely difficult thing to determine in a short examination, a functional test in suspicious cases will usually give a lead in the right direction. We have found that the army test of hopping the applicant fifty times on one foot, examining the heart before and after exercise, and noting particularly the rapidity of the pulse, its force and regularity, and the time required for it to fall to normal, is the most valuable crude method which we have at present of determining the function of the myocardium.

* Classification of C. C. Burlingame, Service Director, Cheney Bros.

But more important than the action of the pulse is the reaction of the respiratory center to this moderately violent exercise. A patient who becomes breathless or shows any signs of abnormal breathing after this exercise, as compared with the normal man, is one who should be studied with great care and who should not be assigned work which will throw any strain upon the heart. This point of breathlessness has been emphasized by Lewis in his recent monograph on *The Soldier's Heart and the Effort Syndrome*. The exercise also immediately shows up any cases of that mysterious condition known in the army as neuro-circulatory-asthenia, the familiar N.C.A. Though many of these cases were met in the army, I have seen practically none in industrial work. They should, however, if met, be immediately rejected as they have no business in the hard work of industry.

Nephritic. — Nephritic patients can be most rapidly discovered by blood pressure determinations. A good general rule is to make a blood pressure determination on all men of 40 or over, and urinalysis on all those showing a pressure of 140 systolic, 90 diastolic. Nephritic cases cannot stand the extremes of heat and cold which exist in many departments nor have they the resiliency against hard work that the normal individual has at the same age.

Pulmonary. — The most frequent pulmonary condition found among sub-standard men is a latent tuberculosis. This may be discovered by a combination of the patient's general build, physical signs in the chest, and breathlessness on exertion. Again, we see the advantage of putting the patient through the fifty hops on one foot, and by this simple method we are able to judge two conditions, cardiac and pulmonary. Applicants with latent tuberculosis can be employed in numerous departments in the factory, but should certainly not be put in a dusty, dark or humid workroom. If kept in a bright, dry workroom they are able to do excellent work without breaking down.

Hernial. — One of the most perplexing conditions which the industrial physician encounters is hernia. Our general rule has been to be extremely careful about admitting men with hernias into industry, partly on account of the compensation risk in cases of strangulation, partly on account of the necessity of repairing the hernia if the man complains of pain after lifting, even if there is no increase in the size of the hernia, and partly because where there is a hernia on one side, there is usually a tendency for a hernia to appear on the other side. Compulsory use of trusses cannot be enforced, so that in the majority of factories there has been a strong feeling against the man who has a hernia. At the Norton Company we have made careful investigation of our hernial risks and as a result of our experience we have come to some conclusions which are rather opposite those usually held. We have found that the majority of our hernias have come from men who entered the company with no sign of hernia whatever, but in whom a hernia has gradually developed while at work. This has been particularly noticeable in the southern Europeans. Among the men who have hernias — some of them large hernias — who were in the employ of the company when physical examinations were first started, we have had no trouble whatever, and recently we have gone so far as to admit applicants for practically any position in the factory who have complete hernias, providing they have been doing heavy work up to within one week of their commencing work at the Norton Company. We find that the majority of these men who have old fifth-degree hernias wear trusses, are familiar with the application of these trusses and take care of themselves, and that they are, on the whole, less risk than the southern European with a weak exter-

nal ring or weak muscles in the region of the rings. Our experience may prove that we have made a mistake in this, but so far our judgment has produced satisfactory results.

Syphilitic. — A diagnosis of tertiary syphilis is very difficult in the short examination which is given the average applicant. However, if the factory hospital is used as it should be, cases are constantly appearing in which there is enough to arouse the doctor's suspicion and lead him to take a Wassermann. These cases, if the Wassermann is positive, should immediately have salvarsan, following which the type of work at which the patients are placed should be carefully investigated. We have found a number of these cases in which the mental degeneration was considerable, rendering the man a danger to himself and others. He will, however, often clear up rapidly after medication and become able to resume, first, light work, and then his original occupation.

Special. — There are naturally a number of conditions which do not fall in any of the above groups, but which, nevertheless, require careful placing. These are too numerous even to mention, but will readily occur to any industrial physician. A typical example would be varicose ulcers of the leg. These may be placed at moderately light work, and with protection do extremely well, the ulcer healing up rapidly under daily cleansing at the hospital and proper support. Flatfoot is another condition in which combination of placing and support gives excellent results. Our own experience goes to show that flatfoot is more a theoretical than a real detriment to good work.

General. — There are always a number of cases which present a combination of conditions which can only be cited as general. Many of these patients fall under class four group, and really have no business to work anywhere in the factory. Others may be placed and a moderate amount of good work obtained from them. Proper placement does not finish the doctor's responsibility. These sub-standard men must be examined from time to time to see that their defects are not increasing and that the placing has been proper. Such an examination should be made as a routine twice a year; and at each examination a record should be made showing the patient's condition. The doctor should take enough time to discuss with the patient his findings, and to give advice as to how the patient may maintain himself in good condition. If the patient has confidence in the doctor and medical service, and has been thoroughly explained the symptoms which mean beginning trouble, he will present himself for examination long before there are any real signs of breaking down.

In closing, I would point out that the problem of the sub-standard worker is one which can only be solved by the industrial physician and the employment manager, and then only by enthusiasm, careful work and strict co-operation.

BOOKS RECEIVED

Books received are acknowledged in this column, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

Syphilis and Public Health. By Edward B. Vedder, A.M., M.D., Lieutenant-Colonel, Medical Corps, United States Army. Published by permission of the Surgeon-General, United States Army. Cloth. Pp. 301 and index. Philadelphia: Lea & Febiger, 1918.

Pathogenic Microörganisms. A Practical Manual for Students, Physicians and Health Officers. By William Hallock Park, M.D., Professor of Bacteriology and Hygiene, University and Bellevue Hospital Medical College, and Director of the Bureau of Laboratories of the Department of Health, New York City; and Anna Wessels Williams, M.D., Assistant Director of the Bureau of Laboratories of the Department of Health, Consulting Pathologist to the New York Infirmary for Women and Children; assisted by Charles Krumwiede, Jr., M.D., Assistant Director of the Bureau of Laboratories, Assistant Professor of Bacteriology and Hygiene in the University and Bellevue Hospital Medical College, New York City. Cloth. Pp. 786 with illustrations and index. Philadelphia: Lea & Febiger, 1920.

Prices and Price Control in Great Britain and the United States during the World War. By Simon Litman, Professor of Economics, University of Illinois. Carnegie Endowment for International Peace. Preliminary Economic Studies of the War, No. 19. Edited by David Kinley, Professor of Political Economy, University of Illinois; Member of Committee of Research of the Endowment. Paper. Pp. 331 with index. New York: Oxford University Press, 1920.

The Physiology of Vision. With Special Reference to Colour Blindness. By F. W. Edridge-Green, M.D., F.R.C.S., Oculist London Pensions Boards; late Chairman Ophthalmic Board, Central London Medical Boards, National Service; late Member International Code of Signals Committee; late Hunterian Professor of the Royal College of Surgeons, etc.; Inventor of Colour Perception Spectrometer, Colour Perception Lantern the Official Test of the Navy; and Bead Test, the Test of the National Service. Cloth. Pp. 280 with illustrations and index. London: G. Bell and Sons, Ltd., 1920.

Hygiene: Dental and General. By Clair Elsmere Turner, Assistant Professor of Biology and Public Health in the Massachusetts Institute of Technology; Assistant Professor of Hygiene in the Tufts College Medical and Dental Schools. With Chapters on Dental Hygiene and Oral Prophylaxis by William Rice, Dean, Tufts College Dental School. Cloth. Pp. 400 with illustrations and index. St. Louis: C. V. Mosby Company, 1920.